PROGRAMMING AND LOGIC

COURSE DESCRIPTION

Programming and Logic **is a course in which students will develop skills in problem analysis, construction of algorithms, and computer implementation of algorithms as they work on programming projects of increasing complexity. The recommended programming environment is** *DrScheme***, as it permits an emphasis on development of analytic skills rather than any particular language syntax or vocabulary. Emphasis is on actual programming projects, both individual and group. Course content should be repeatedly applied to increasingly complex projects.**

Prerequisite(s):   **Algebra I or Math for Technology II (may be taken concurrent)**

Recommended Credits: **1**

Recommended Grade Level(s):   **10th, 11th, or 12th**

PROGRAMMING AND LOGIC STANDARDS

1.0   Students will demonstrate leadership, citizenship, and teamwork skills required for success in the school, community, and workplace.

2.0   Students will analyze problem statements.

3.0   Students will solve problem statements.

4.0   Students will use computer processes and features to implement algorithms to solve problems.

5.0   Students will create computer instructions to resolve logical and user errors.

6.0   Students will design a simple computer application to meet the requirements of a given context.

PROGRAMMING AND LOGIC

STANDARD 1.0

Students will demonstrate leadership, citizenship, and teamwork skills required for success in the school, community, and workplace.

LEARNING EXPECTATIONS

The student will:
1.1   Exhibit positive leadership skills.
1.2   Participate in SkillsUSA-VICA as an integral part of classroom instruction.
1.3   Assess situations and apply problem-solving and decision-making skills to particular client relations in the community, and workplace.
1.4   Demonstrate the ability to work cooperatively with others in a professional setting.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:
1.1   Demonstrates character, leadership, and integrity using creative and critical-thinking.
1.2.A Applies the points of the creed to personal and professional situations.
1.2.B Participates and conducts meetings and other business according to accepted rules of parliamentary procedure.
1.3.A Analyzes situations in the workplace and uses problem-solving techniques to solve the problem.
1.4.A Participates in a community service project.
1.4.B Assists with a an officer campaign with Tennessee SkillsUSA-VICA.

SAMPLE PERFORMANCE TASKS

- Create a leadership inventory and use it to conduct a personal assessment.
- Participate in various SkillsUSA-VICA programs and/or competitive events.
- Evaluate an activity within the school, community, and/or workplace and project effects of the project.
- Implement an annual program of work.
- Prepare a meeting agenda for a SkillsUSA-VICA monthly meeting.
- Attend a professional organization meeting.
- Participate in the American Spirit Award competition with SkillsUSA-VICA.

INTEGRATION LINKAGES

SkillsUSA-VICA, *Professional Development Program,* SkillsUSA-VICA, Communications and Writing Skills, Teambuilding Skills, Research, Language Arts, Sociology, Psychology, Math, Math for Technology, Applied Communications, Social Studies, Problem Solving, Interpersonal Skills, Employability Skills, Critical-Thinking Skills, SCANS (Secretary's Commission on

Achieving Necessary Skills), Chamber of Commerce, Colleges, Universities, Technology Centers, and Employment Agencies

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STANDARD 2.0

Students will analyze problem statements.

LEARNING EXPECTATIONS

The student will:
2.1   Analyze problem statements.
2.2   Express the essence of problem statements.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:
2.1.A   Analyzes given problem statements stated as word problems.
2.1.B   Breaks the problem statement into its components.
2.2.A   Expresses the essence of problem statements abstractly.
2.2.B   Generates examples of the essence of a problem statement.

SAMPLE PERFORMANCE TASKS

Student groups, given a written problem statement, analyze the problem and prepare written descriptions (algorithms) of the process to solve it. A typical problem might be theater proceeds.

INTEGRATION/LINKAGES

Foundation for Industrial Modernization (FIM*). What Manufacturing Workers Need to Know and Be Able to Do: National Voluntary Skill Standards for Advanced High Performance Manufacturing*. Washington, DC: National Coalition for Advanced Manufacturing, 1995. International Technology Education Association. *Standards for Technological Literacy: Content for the Study of Technology.* International Technology Education Association. Reston, VA, 2000. Manufacturing Skill Standards Council. *A Blueprint for Workforce Excellence (draft skill standards for manufacturing.)* Manufacturing Skill Standards Council, 2001. Mathematics concepts and skills. Computer Science concepts and skills.

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STANDARD 3.0

Students will solve problem statements.

LEARNING EXPECTATIONS

The student will:
3.1   Express problem statements clearly.
3.2   Solve problem statements.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:
3.1.A   Distinguishes the components of a word problem.
3.1.B   Formulates statements and comments in a precise language.
3.2.A   Devises a problem-solving algorithm.
3.2.B   Evaluates and revises the problem-solving algorithm in light of checks and tests.

SAMPLE PERFORMANCE TASKS

Student groups, given a written problem statement, analyze the problem and prepare written descriptions (algorithms) of the process to solve it. A typical problem might be sandwich assembly.

INTEGRATION/LINKAGES

Foundation for Industrial Modernization (FIM*). What Manufacturing Workers Need to Know and Be Able to Do: National Voluntary Skill Standards for Advanced High Performance Manufacturing*. Washington, DC: National Coalition for Advanced Manufacturing, 1995. International Technology Education Association. *Standards for Technological Literacy: Content for the Study of Technology.* International Technology Education Association. Reston, VA, 2000. Manufacturing Skill Standards Council. *A Blueprint for Workforce Excellence (draft skill standards for manufacturing.)* Manufacturing Skill Standards Council, 2001. Mathematics concepts and skills. Computer Science concepts and skills.

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STANDARD 4.0

Students will use computer processes and features to implement algorithms to solve problems.

LEARNING EXPECTATIONS

Students will:
4.1   Perform the steps required of an algorithms.
4.2   Use computer processes and features for problem solving.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:
4.1.A   Defines the appropriate variables, correctly construct the functions, and apply the appropriate arithmetic operations to implement the steps required by a given algorithm.
4.1.B   Combines conditional and branching statements to make a decision in an algorithm.
4.2.A   Predicts the computer processes and features that will implement algorithms to solve a given problem.
4.2.B   Executes the appropriate computer processes to solve a given problem.

SAMPLE PERFORMANCE TASKS

- Students experiment with computer processes and features (e.g., arithmetic operations, data structures, conditional tests) that will implement algorithms to solve problems.
- Students make use of iterative and/or recursive processes to expedite algorithms.

INTEGRATION/LINKAGES

Foundation for Industrial Modernization (FIM). *What Manufacturing Workers Need to Know and Be Able to Do: National Voluntary Skill Standards for Advanced High Performance Manufacturing*. Washington, DC: National Coalition for Advanced Manufacturing, 1995. International Technology Education Association. *Standards for Technological Literacy: Content for the Study of Technology*. International Technology Education Association. Reston, VA, 2000. Manufacturing Skill Standards Council. *A Blueprint for Workforce Excellence (draft skill standards for manufacturing.)* Manufacturing Skill Standards Council, 2001. Mathematics concepts and skills. Computer Science concepts and skills.

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STANDARD 5.0

Students will create computer instructions to resolve logical and user errors.

LEARNING EXPECTATIONS

Students will:
5.1   Trap logical errors in a program.
5.2   Discover the limitations of number representation in a computer.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:
5.1.A Constructs conditional and branching statements that trap logical errors in a given
          program.
5.1.B Constructs conditional and branching statements that trap user errors in a given program.
5.2.A Expresses the limitations of number representation in computers.
5.2.B Deduces the limitations of number representation in a given set of instructions.

SAMPLE PERFORMANCE TASKS

Students construct computer instructions that avoid complications caused by the limited range
and precision of numbers used by the computer.

INTEGRATION/LINKAGES

Foundation for Industrial Modernization (FIM). *What Manufacturing Workers Need to Know
and Be Able to Do: National Voluntary Skill Standards for Advanced High Performance
Manufacturing*. Washington, DC: National Coalition for Advanced Manufacturing, 1995.
International Technology Education Association. *Standards for Technological Literacy: Content
for the Study of Technology.* International Technology Education Association. Reston, VA, 2000.
Manufacturing Skill Standards Council. *A Blueprint for Workforce Excellence (draft skill
standards for manufacturing.)* Manufacturing Skill Standards Council, 2001. Mathematics
concepts and skills. Computer Science concepts and skills.

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STANDARD 6.0

Students will design a simple computer application to meet the requirements of a given context.

LEARNING EXPECTATIONS

Students will:
6.1   Assess the needs of users.
6.2   Design a program to meet the requirements of users.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:
6.1.A   Evaluates the needs of users through interview and observation.
6.1.B   Identifies the logical problem to be solved by the program.
6.2.A   Devises a solution to the problem.
6.2.B   Creates an application to perform the required functions.
6.2.C   Tests and revises the application as needed.
6.2.D   Prepares documentation for the application developed.

SAMPLE PERFORMANCE TASKS

Students participate in a case study in which they must identify the needs of given users and create a workable solution.

INTEGRATION/LINKAGES

Foundation for Industrial Modernization (FIM*). What Manufacturing Workers Need to Know and Be Able to Do: National Voluntary Skill Standards for Advanced High Performance Manufacturing*. Washington, DC: National Coalition for Advanced Manufacturing, 1995. International Technology Education Association. *Standards for Technological Literacy: Content for the Study of Technology.* International Technology Education Association. Reston, VA, 2000. Manufacturing Skill Standards Council. *A Blueprint for Workforce Excellence (draft skill standards for manufacturing.)* Manufacturing Skill Standards Council, 2001. Mathematics concepts and skills. Computer Science concepts and skills, Communications and interpersonal skills.

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<u>RESOURCES</u>

How to Design Programs: An Introduction to Programming and Computing. MIT Press Edition,
January 2001. Available free online at http://www.htdp.org/2001-01-18/Book.